CopperLink™ Model 1211E/1212E
Industrial High Speed Ethernet Extender

User Manual

CE This is a Class A device and is not intended for use in a residential environment.

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Part Number: **07MCL1212E-UM, Rev. E**
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Warranty Information

Patton Electronics warrants all CopperLink components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of the shipment.

This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse or unauthorized modification. If the product fails to perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall Patton Electronics be liable for any damages incurred by the use of this product. These damages include, but are not limited to, the following: lost profits, lost savings and incidental or consequential damages arising from the use of or inability to use this product. Patton Electronics specifically disclaims all other warranties, expressed or implied, and the installation or use of this product shall be deemed an acceptance of these terms by the user.

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About This Guide

This guide describes the CopperLink Model 1211E/1212E hardware, installation, and basic configuration.

Audience

This guide is intended for the following users:

- Operators
- Installers
- Maintenance technicians

Structure

This guide contains the following chapters and appendices:

- Chapter 1 on page 12 provides information about CL1212E features and capabilities
- Chapter 2 on page 15 provides information about installing the CL1212E interfaces
- Chapter 3 on page 20 provides information about the CL1212E configuration
- Chapter 4 on page 24 provides information about the CL1212E operation
- Appendix A on page 29 provides compliance information for the CL1212E
- Appendix B on page 32 provides specifications for the CL1212E
- Appendix C on page 34 provides a table of replacements for parts and accessories
- Appendix D on page 36 provides diagrams of detailed pin assignments
- Appendix E on page 38 provides a line range and reach chart for the CL1212E

For best results, read the contents of this guide *before* you install the CopperLink 1212E.

Precautions

Notes and cautions, which have the following meanings, are used throughout this guide to help you become aware of potential Router modem problems. ***Warnings*** relate to personal injury issues, and ***Cautions*** refer to potential property damage.

A note presents additional information or interesting sidelights.

The alert symbol and IMPORTANT heading calls attention to important information.

The alert symbol and CAUTION heading indicate a potential hazard. Strictly follow the instructions to avoid property damage.

The shock hazard symbol and CAUTION heading indicate a potential electric shock hazard. Strictly follow the instructions to avoid property damage caused by electric shock.

The alert symbol and WARNING heading indicate a potential safety hazard. Strictly follow the warning instructions to avoid personal injury.

The shock hazard symbol and WARNING heading indicate a potential electric shock hazard. Strictly follow the warning instructions to avoid injury caused by electric shock.

Safety When Working With Electricity

- **This device contains no user serviceable parts. This device can only be repaired by qualified service personnel.**
- **Do not open the device when the power cord is connected. For systems without a power switch and without an external power adapter, line voltages are present within the device when the power cord is connected.**
- **For devices with an external power adapter, the power adapter shall be a listed Limited Power Source. The mains outlet that is utilized to power the device shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker in compliance with local regulatory requirements.**
- **For AC powered devices, ensure that the power cable used meets all applicable standards for the country in which it is to be installed.**
- **For AC powered devices which have 3 conductor power plugs (L1, L2 & GND or Hot, Neutral & Safety/Protective Ground), the wall outlet (or socket) must have an earth ground.**
- **For DC powered devices, ensure that the interconnecting cables are rated for proper voltage, current, anticipated temperature, flammability, and mechanical serviceability.**
- **WAN, LAN & PSTN ports (connections) may have hazardous voltages present regardless of whether the device is powered ON or OFF. PSTN relates to interfaces such as telephone lines, FXS, FXO, DSL, xDSL, T1, E1, ISDN, Voice, etc. These are known as “hazardous network voltages” and to avoid electric shock use caution when working near these ports. When disconnecting cables for these ports, detach the far end connection first.**
- **Do not work on the device or connect or disconnect cables during periods of lightning activity.**

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

This device contains no user serviceable parts. This device can only be repaired by qualified service personnel.

This device is NOT intended nor approved for connection to the PSTN. It is intended only for connection to customer premise equipment.

Electrostatic Discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures. Do the following to prevent ESD:

- Always follow ESD prevention procedures when removing and replacing cards.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground.
- To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

Chapter 1 General information

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Overview

Thank you for purchasing this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for one year for parts and labor. If any questions or problems arise during installation or use of this product, contact Patton Electronics Technical Support at +(301) 975-1007.

Features

- Variable rate CopperLink Ethernet extender - Easy to configure
- Auto-MDIX Ethernet
- Configurable 10/100, Full/Half, and Auto-Negotiating Ethernet
- Extends up to 1 or 2 10/100Base-TX Ethernet beyond 328-foot (100-meter) limitation over a single twisted-pair, Cat 5e/6/7
- Variable line rate settings via DIP switch
- Transparent operation
- LED indicators for Power, Line, Local, Remote, Ethernet 0 and 1 (Eth 0 and Eth 1), and Ethernet Link/Activity
- -40 to 85°C operating temperature; optional conformal coating for protection against condensing humidity and corrosion.

Description

Patton Electronics CL1212E Ethernet extenders provide high-speed LAN connections between peered Ethernet LANs, remote PCs, or any other network-enabled 10/100Base-T device.

Operating in pairs, one CL1212E is configured as the (L) Local unit located at one end of the LAN extension and the other CL1212E is configured as the (R) Remote unit at the other end. The CL1212E is configured as an L or R via the switch on the bottom of the unit. These units can automatically forward LAN broadcasts, multicasts, and frames across a 2-wire voice-grade twisted-pair. The data is passed transparently (unmodified) through the CL1212E. The CL1212Es automatically add and delete MAC addresses, only passing packets across the Line link that are meant for the remote peered LAN.

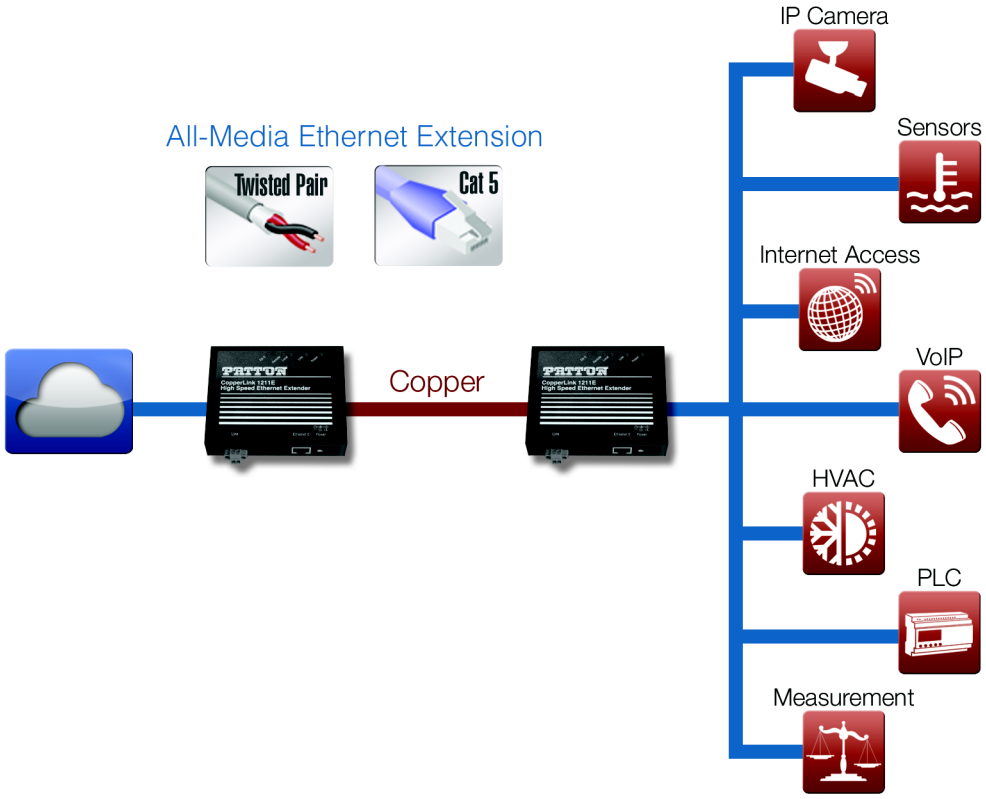

Figure 1. Typical applications

The pair of CL1212E models work together to create a transparent extension between two peered Ethernet LANs using twisted pair (2-wire) or Cat5+. Figure 1 shows typical applications.

Chapter 2 Installation

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Planning the Installation

CAUTION

The Interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

To install the CL1212E Ethernet Extender, do the following:

1. Connect the line interface between the units (refer to "Connecting the Line Interface" on page 17)

   Note See figure 2 for the CL1212E's rear panel.

2. Connect the Ethernet interface (refer to "Connecting the 10/100Base-T Ethernet Interface" on page 18).
3. Connect the power plug (refer to "Connecting Power" on page 19).

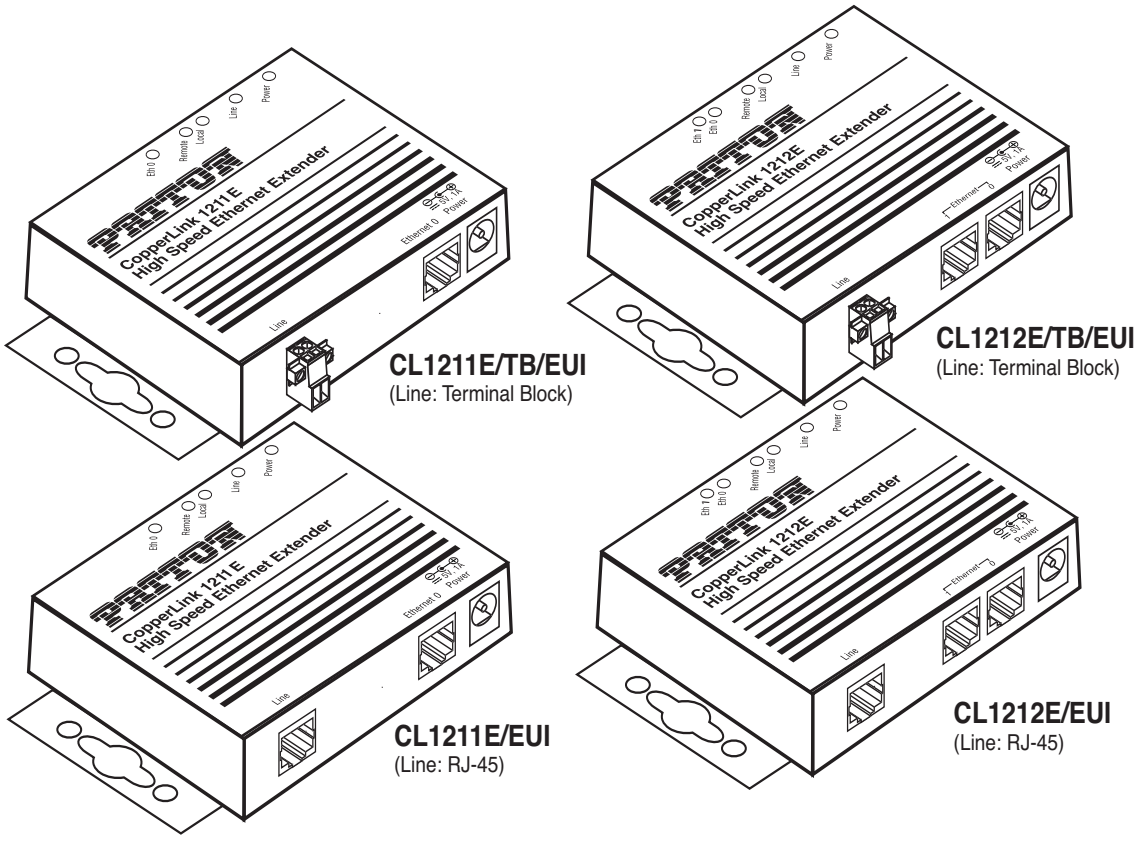

Figure 2. CL1211E/CL1212E rear panel options

Connecting the Line Interface

CAUTION

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

The CL1212E supports communication between two peer Ethernet LAN sites over a distance of up to 10,000 ft (3 km) over 24 AWG (0.5 mm) twisted-pair wire, Cat5+.

Note Actual distance and link performance may vary depending on the environment and type/gauge of wire used.

Follow the steps below to connect the CL1212E interfaces.

Note The CL1212E units work in pairs. One of the units must be configured as a (L) Local unit, and the other unit must be configured as a (R) Remote unit.

Connecting the Line Interface for CL1212

1. To function properly, the two CL1212E's must be connected together using twisted-pair, unconditioned, dry, metal wire, between 19 (0.9mm) and 26 AWG (0.4mm). Leased circuits that run through signal equalization equipment are not acceptable.
2. The CL1212E is equipped with an RJ-45 interface jack (figure 3)

The RJ-45 connector on the CL1212E's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationship is shown in figure 3.

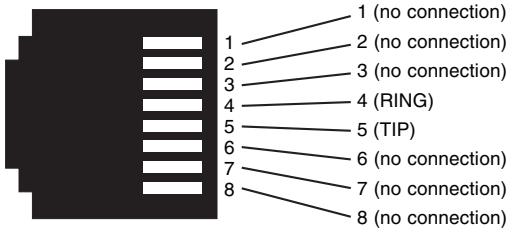

Figure 3. CL1212E (RJ-45) twisted pair line interface.

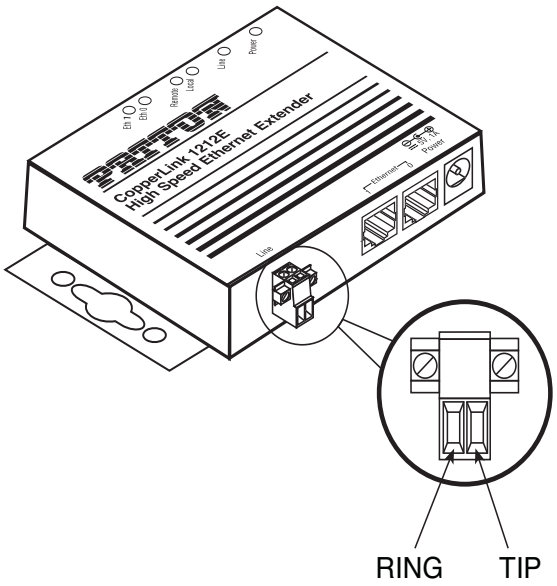

Figure 4. CL1212E (Terminal Block) twisted pair line interface

Connecting the 10/100Base-T Ethernet Interface

CAUTION

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

The RJ-45 ports labeled *Eth 0 and Eth 1* are Auto-MDIX 10/100Base-T interfaces. These ports are designed to connect directly to a 10/100Base-T device or network. Figure 5 shows the signal/pin relationships on this interface. You may connect this port to a hub or PC using a straight through or crossover cable that is up to 328 ft long.

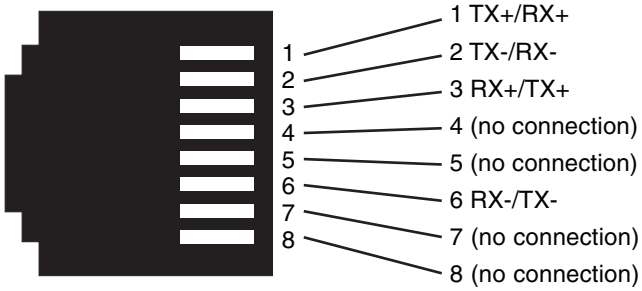

Figure 5. CL1212E 10/100Base-T RJ-45 Connector Pin-out.

Connecting Power

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

The CL1212E does not have a power switch, so it powers up as soon as it is plugged in.

An external AC or DC power supply is available separately. This connection is made via the barrel jack on the rear panel of the CL1212E. No configuration is necessary for the power supply.

DC power (supplied via the power supply jack to the CL1212) must meet the following requirements; DC power supplied must be regulated 5 VDC ±5%, 1.0A minimum. Center pin is +5 V. The barrel type plug has 2.5/5.5/10mm I.D./O.D./Shaft Length dimensions.

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Introduction

The CL1212E has eight DIP switches (S1) for configuring the unit for a wide variety of applications. This section describes switch locations and explains the different configurations.

Accessing the DIP Switches

1. Using a small flat-tip screwdriver, remove the protective cover located on the underside of the CL1212E (see figure 6).

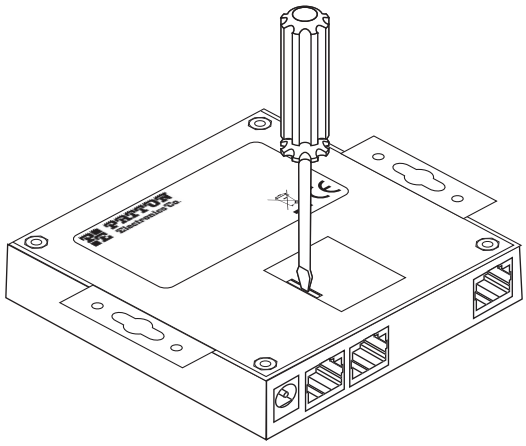

Figure 6. Removing protective cover

2. The DIP switches are externally accessible from the underside of the CL1212E. Figure 7 shows the orientation of the DIP switches in the On and Off positions.

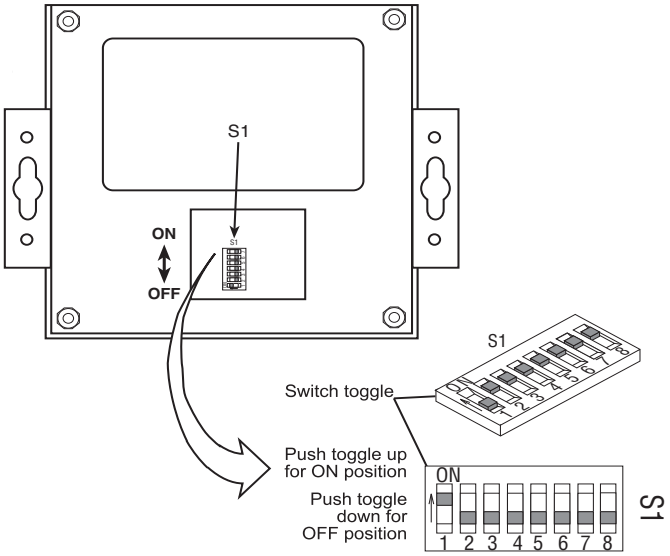

Figure 7. DIP switch orientation

Configuring DIP Switch S1

DIP switch S1 is where you configure the Line interface. The following tables describe the configuration for the CL1212E.

Table 1. S1 Summary

Position	Description
S1-1	Local/Remote Configuration
S1-2	Line Rate/Symmetry
S1-3	Line Rate/Symmetry
S1-4	Reserved
S1-5	SNR Margin
S1-6	Reserved
S1-7	Reserved
S1-8	Reserved

Switch S1-1: Local/Remote Configuration

Use switch S1-1 to configure the unit as Remote or Local in the CL1212E pair.

Table 2. Local/Remote Unit Configuration

S1-1	Setting
ON	CPE/Remote
OFF	CO/Local

Switches S1-2 and S1-3: Symmetric/Asymmetric Operation

Use switches S1-2 and S1-3 to configure the line rate type and operation.

Table 3. Symmetric/Asymmetric Selection Chart

S1-2	S1-3	Setting
OFF	OFF	High-Speed “Symmetric”
OFF	ON	High-Speed “Asymmetric”
ON	OFF	FastPath High-Speed “Asymmetric”
ON	ON	Long-Range “Asymmetric”

Note See “Line Rate & Reach Chart Based on 24 AWG (0.5 mm)” on page 39 for line rate distances.

Switch S1-5: General Protection (Signal to Noise Ratio)

Use switch S1-5 to configure line noise protection.

Table 4. Signal to Noise Ratio

S1-5	Setting
ON	6dB
OFF	9dB

- **6dB:** Original line noise protection with 6dB SNR
- **9dB:** Better line noise protection with SNR up to 9dB

Chapter 4 Operation

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Introduction

Once the CL1212Es are properly installed, they should operate transparently. No user settings required. This section describes reading the LED status monitors.

Before applying power to the CL1212E, please review "Connecting Power" on page 19 to verify that the unit is connected to the appropriate power source.

Front Panel LED Status Monitors

The CL1212E features six front panel LEDs that monitor power, the Ethernet signals, the Line connection, and the remote/local setting. Figure 8 shows the front panel location of each LED. Table 5 on page 25 describes the LED functions.

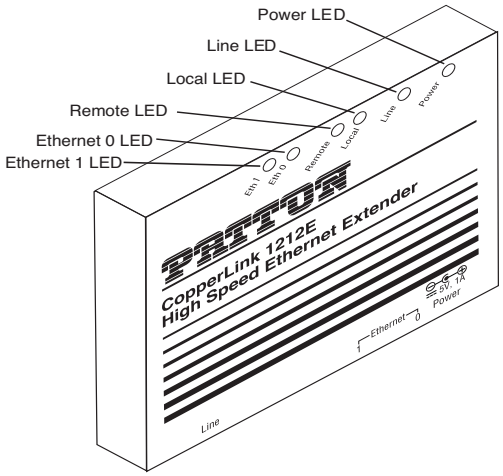

Figure 8. CL1212E front panel

Table 5. Front panel LED description

LED	Status	Description
Power	Green	The device is powered on.
	Off	The device is powered off.
Line	Green	The port is connected.
	Blinking Green	Data transceiving.
	Off	No valid link on this port.
Eth 0 and Eth 1	Green	The port is connected.
	[a]Blinking Green	Data transceiving.
Local	Green	The device acts in Local mode.
	Off	Local mode is off.
Remote	Green	The device acts in Remote mode.
	Off	Remote mode is off.

a. Once the unit connects to a power source, the LED will blink as the CL1212E automatically looks for the other unit in the pair.

Chapter 5 Contacting Patton for assistance

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Introduction

This chapter contains the following information:

- "Contact information"—describes how to contact Patton technical support for assistance.
- "Warranty Service and Returned Merchandise Authorizations (RMAs)"—contains information about the warranty and obtaining a return merchandise authorization (RMA).

Contact information

Patton Electronics offers a wide array of free technical services. If you have questions about any of our other products we recommend you begin your search for answers by using our technical knowledge base. Here, we have gathered together many of the more commonly asked questions and compiled them into a searchable database to help you quickly solve your problems:

- Online support—available at **www.patton.com**
- E-mail support—e-mail sent to **support@patton.com** will be answered within 1 business day
- Telephone support—standard telephone support is available five days a week—from **8:00 am** to **5:00 pm EST** (**1300** to **2200 UTC**)—by calling **+1 (301) 975-1007**

Warranty Service and Returned Merchandise Authorizations (RMAs)

Patton Electronics is an ISO-9001 certified manufacturer and our products are carefully tested before shipment. All of our products are backed by a comprehensive warranty program.

> **Note** If you purchased your equipment from a Patton Electronics reseller, ask your reseller how you should proceed with warranty service. It is often more convenient for you to work with your local reseller to obtain a replacement. Patton services our products no matter how you acquired them.

Warranty Coverage

Our products are under warranty to be free from defects, and we will, at our option, repair or replace the product should it fail within one year from the first date of shipment. Our warranty is limited to defects in workmanship or materials, and does not cover customer damage, lightning or power surge damage, abuse, or unauthorized modification.

Out-of-Warranty Service

Patton services what we sell, no matter how you acquired it, including malfunctioning products that are no longer under warranty. Our products have a flat fee for repairs. Units damaged by lightning or other catastrophes may require replacement.

RMA Numbers

RMA numbers are required for all product returns. You can obtain an RMA by doing one of the following:

- Completing a request on the RMA Request page in the *Support* section at **www.patton.com**
- By calling **+1 (301) 975-1007** and speaking to a Technical Support Engineer
- By sending an e-mail to **returns@patton.com**

All returned units must have the RMA number clearly visible on the outside of the shipping container. Please use the original packing material that the device came in or pack the unit securely to avoid damage during shipping.

Shipping Instructions

The RMA number should be clearly visible on the address label. Our shipping address is as follows:

Patton Electronics Company
RMA#: xxxx
7622 Rickenbacker Dr.
Gaithersburg, MD 20879-4773 USA

Patton will ship the equipment back to you in the same manner you ship it to us. Patton will pay the return shipping costs.

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Regulatory Information

EMC Directive:

- FCC Part 15, Class A
- EN55022, Class A
- EN55024
- EN50581

Low-Voltage Directive (Safety):

- IEC/EN60950-1, 2nd Edition
- UL60950-1/CSA C22.2 No. 60950-1

PSTN:

- This device is not intended nor approved for connection to the PSTN

Radio and TV Interference (FCC Part 15)

This device generates and uses radio frequency energy, and if not installed and used properly-that is, in strict accordance with the manufacturer's instructions-may cause interference to radio and television reception. The device has been tested and found to comply with the limits for a Class A computing device in accordance with specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the device does cause interference to radio or television reception, which can be determined by disconnecting the unit, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

CE Declaration of Conformity

This device is in compliance with the essential requirements and other relevant provisions of Directive 2004/108/EC relating to electromagnetic compatibility and Directive 2006/95/EC relating to electrical equipment designed for use within certain voltage limits. The Declaration of Conformity may be obtained from Patton Electronics, Inc at www.patton.com/certifications.

The safety advice in the documentation accompanying this device shall be obeyed. The conformity to the above directive is indicated by CE mark on the device.

Authorized European Representative

D R M Green
European Compliance Services Ltd
Greyfriars Court
Paradise Square
Oxford, OX1 1BE, UK

Service

All warranty and non-warranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Services at:

- Tel: +1 (301) 975-1007
- Email: **support@patton.com**
- URL: **http://www.patton.com**

Packages received without an RMA number will not be accepted.

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Line Connector

- RJ-45 or Terminal Block

LAN Connectors

- CL1212E: 2 RJ-45, 10/100Base-T, IEEE 802.3 Ethernet
- CL1211E: 1 RJ-45, 10/100 Base-T, 1EEE 802.3 Ethernet

Transmission Line

Two-wire unconditioned twisted pair

LED Status Indicators

- Power (Green)
- Line (Green)
- Local (Green)
- Remote (Green)
- Ethernet (Green when linked; flashing green when transceiving data)

Power Supply

External AC option:

- AC: 120 VAC, 220 VAC, and UI (120–240 VAC)
- DC: 12 VDC, 24 VDC and 48 VDC, 5 VDC
- Power consumption: 1 A at 5 VDC

Physical

Operating Temperature Range

-40° to 185°F (-40° to 85°C)

Humidity

Up to 90% non-condensing.

Optional conformal coating for 85% condensing humidity and protection from corrosion

Dimensions

5.57W x 1.12H x 3.57D in. (14.15W x 2.8H x 9.07D cm) with bracket ears

4.44W x 1.12H x 3.57D in. (11.28 x 2.84H x 9.07D cm) without bracket ears

Appendix C Factory Replacement Parts and Accessories

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CL1211E/CL1212E Factory Replacement Parts and Accessories

Patton Model #	Description
Base Models	
07MCL1212E-UM	User Manual
Power Supplies	
PS-03671H1-004	100–240 VAC (5 V, DC/3 A) Wall mount power adapter
12V- PSM	12 VDC Input Adapter
24V-PSM	24 VDC Input Adapter
48V-PSM	48 VDC Input Adapter
Power Plugs for Universal Input AC Power Supply	
12-130	European replacement plug
12-129	American replacement plug
12-131	United Kingdom plug
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10/100Base-T Interface

RJ-45

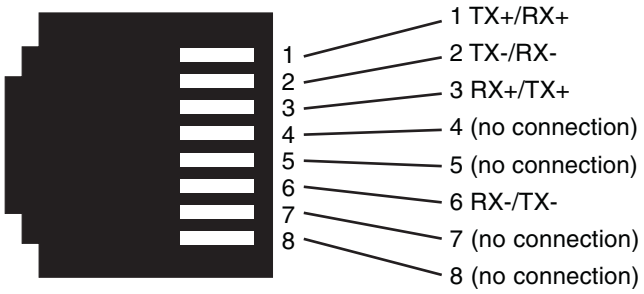

Figure 9. CL1212E 10/100Base-T RJ-45 Connector Pin-out.

Line Interface

RJ-45

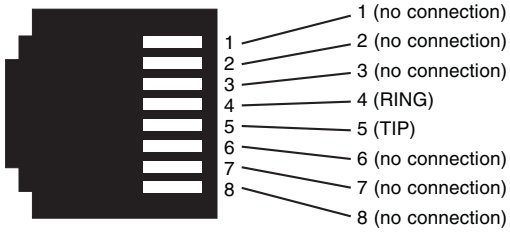

Figure 10. CL1212E RJ-45 Twisted-Pair Line Interface Connector Pin-out

Terminal Block

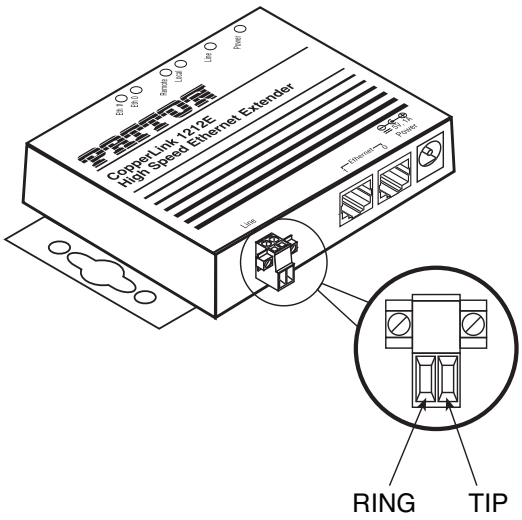

Figure 11. CL1212E Line Interface Terminal Block Pin-out

Appendix E **Line Rate & Reach Chart**

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Line Rate & Reach Chart Based on 24 AWG (0.5 mm) 39

Line Rate & Reach Chart Based on 24 AWG (0.5 mm)

Table 6. Line Rate & Reach Chart Using Twisted-Pair (Long Range)

Mode (Long Range)	Distance in Feet		Mbps	
	ft	m/km	DS	US
Asymmetric S1-2 ON S1-3 ON	250 ft	76 m	67	16
	1000 ft	305 m	59	16
	2,000 ft	610 m	45	11
	3,000 ft	914 m	31	5
	5,000 ft	1.5 km	17	682 kbps
	10,000 ft	3 km	4	263 kbps

Note The actual distance and link performance may vary depending on the environment and type/gauge of wire used.

Note DS = downstream, US = upstream.

Table 7. Line Rate & Reach Chart Using Twisted-Pair (High Speed)

Mode (High Speed)		Distance in Feet		Mbps	
		ft	m/km	DS	US
Symmetric S1-2 OFF S1-3 OFF		250 ft	76 m	121	144
		1000 ft	305 m	73	103
		2,000 ft	610 m	45	37
		3,000 ft	914 m	46	10
		3,500 ft	1 km	30	4
Asymmetric S1-2 OFF S1-3 ON	Standard	250 ft	76 m	168	95
		1000 ft	305 m	126	54
		2,000 ft	610 m	60	21
S1-2 ON S1-3 OFF	FastPath	3,000 ft	914 m	42	6
		3,500 ft	1 km	35	1

Note The actual distance and link performance may vary depending on the environment and type/gauge of wire used

Note DS = downstream, US = upstream